VS8 Sensor Series

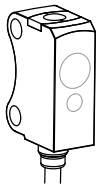
Instruction Manual

Original Instructions
201958 Rev. C
31 August 2021

201958

Contents

1 Product Description



- Miniature sensor for installation in the smallest of spaces
- Red laser models provide bright, precise laser light spot for optimum small part detection
- High switching frequency for detection in even the fastest processes
- User-friendly operation using electronic push button or remote input provides reliable and precise detection
- Red laser, Red LED, and Blue LED types available to match sensing beam to application
- Robust, glass-fiber-reinforced plastic housing
- PNP or NPN output, depending on model

WARNING:

- **Do not use this device for personnel protection**
- Using this device for personnel protection could result in serious injury or death.
- This device does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A device failure or malfunction can cause either an energized (on) or de-energized (off) output condition.

1.1 Models

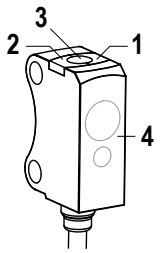
Opposed Models				
Model	**Sensing Mode**	**Range**	**Output**	**Connection**
VS8LEJ	Red Laser Emitter with Beam Inhibit	0 m to 3 m (0 in to 9.8 ft)	–	2 m (6.5 ft) unterminated 4-wire PUR cable
VS8LEJQ			–	200 mm (7.8 in) PUR cable with a 4-pin M8 male quick disconnect (QD)
VS8EAPR	Receiver		PNP	2 m (6.5 ft) unterminated 4-wire PUR cable
VS8EANR			NPN	
VS8EAPRQ			PNP	200 mm (7.8 in) PUR cable with a 4-pin M8 male quick disconnect (QD)
VS8EANRQ			NPN	

Retroreflective Models				
Model	**Sensing Mode**	**Range**	**Output**	**Connection**
VS8EAPLP	Red LED Retro Reflective	0.1 m to 1.6 m (3.9 in to 62.9 in) with BRT-2X2	PNP	2 m (6.5 ft) unterminated 4-wire PUR cable
VS8EANLP			NPN	
VS8EAPLPQ			PNP	200 mm (7.8 in) PUR cable with a 4-pin M8 male quick disconnect (QD)
VS8EANLPQ			NPN	
VS8EAPLLP	Red Laser Retro Reflective	0.1 m to 2 m (3.9 in to 78.7 in) with BRT-51X51BM	PNP	2 m (6.5 ft) unterminated 4-wire PUR cable
VS8EANLLP			NPN	
VS8EAPLLPQ			PNP	200 mm (7.8 in) PUR cable with a 4-pin M8 male quick disconnect (QD)
VS8EANLLPQ			NPN	

Background Suppression Models				
Model [1]	**Sensing Mode**	**Range**	**Output**	
VS8EAPAF70	Red LED, Adjustable Background Suppression	5 mm to 70 mm (0.2 in to 2.8 in)	PNP	2 m (6.5 ft) unterminated 4-wire PUR cable
VS8EANAF70			NPN	
VS8EAPLAF70	Red Laser, Adjustable Background Suppression	6 mm to 70 mm (0.24 in to 2.8 in)	PNP	
VS8EANLAF70			NPN	
VS8APFF30B	Blue LED, Fixed 30 mm Background Suppression	2 mm to 30 mm (0.08 in to 1.18 in)	PNP	
VS8ANFF30B			NPN	
VS8APFF15	Red LED, Fixed 15 mm Background Suppression	2 mm to 15 mm (0.08 in to 0.59 in)	PNP	
VS8ANFF15			NPN	
VS8APFF30	Red LED, Fixed 30 mm Background Suppression	2 mm to 30 mm (0.08 in to 1.18 in)	PNP	
VS8ANFF30			NPN	
VS8APFF50	Red LED, Fixed 50 mm Background Suppression	2 mm to 50 mm (0.08 in to 1.97 in)	PNP	
VS8ANFF50			NPN	

1.2 Features

Figure 1. VS8 Sensor Features



Features

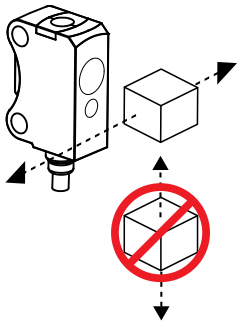
1. Green Indicator
2. Amber Indicator
3. TEACH Button - Laser Adjustable Field (LAF), Adjustable Field (AF), Polar Retro (LP), and Receiver (R) Models
4. Optical Window

[1]
- To order the 200 mm (7.8 in) PUR cable model with a 4-pin M8 quick disconnect, add suffix "Q" to the model number. For example, VS8EAPAF70Q. Only available for AF and LAF models.
- To order the 200 mm (7.8 in) PUR cable model with a 3-pin M8 quick disconnect, add suffix "Q3" to the model number. For example, VS8APFF15Q3. Only available for FF models.
- To order the 200 mm (7.8 in) PUR cable model with a 4-pin M12 quick disconnect, add suffix "Q5" to the model number. For example, VS8EAPAF70Q5. Only available for AF and LAF models.

2 Sensor Installation

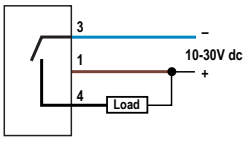
Install the sensor so the object to be detected moves horizontally to the sensor.

Figure 2. VS8 Sensor Installation

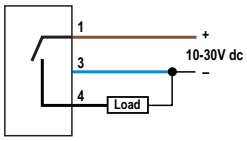


2.1 Wiring Diagrams

3-Pin NPN Models



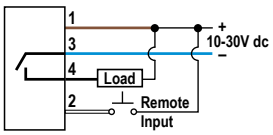
3-Pin PNP Models



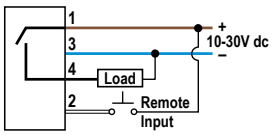
Key

1. Brown
2. White
3. Blue
4. Black

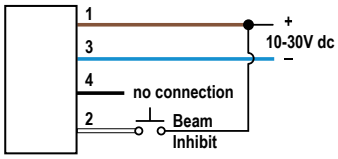
4-Pin NPN Models



4-Pin PNP Models



Opposed Mode Emitters



Note: All 4-pin and cabled models have a remote input on the white wire (pin-2).

3 Sensor Configuration

- *Expert*™ 4-pin background suppression, retroreflective, and opposed mode receiver models are configurable using either the sealed push button or the remote input wire.
- 3-pin fixed field and opposed mode emitter models require no user adjustments.
- The remote input wire (pin-2/white wire) is used to select light or dark operate or perform the desired TEACH method. Pulse durations for the remote input wire correspond to the indicated press durations of the push button.

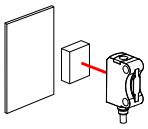
3.1 Remote Configuration – 4-Pin Models

The remote input wire (pin-2/white wire) is used to select light or dark operate, or perform the desired TEACH method. Closing and opening times for the remote input wire correspond to the indicated press/hold durations of the push button.

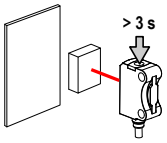
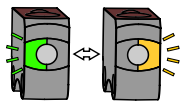
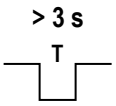
3.2 Two-Point Static Background Suppression

Two-point TEACH sets a single switch point. The sensor sets the switch point between two taught target distances, relative to the shifted origin location.

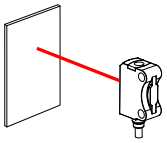
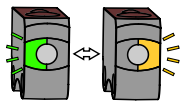
1. Present the target.

Method	Action	Result
Push Button **Remote Input**	Present the first target. The sensor-to-target distance must be within the sensor's range. 	N/A

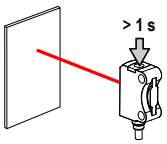
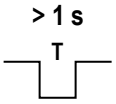
2. Start TEACH mode.

Method	Action	Result
Push Button	Press and hold push button > 3 seconds. 	 BOTH LEDs FLASHING ALTERNATING
Remote Input	Pulse remote input wire > 3 seconds. 	

3. Present the background or second target.

Method	Action	Result
Push Button **Remote Input**	Present the background or second target. The sensor-to-target distance must be within the sensor's range. 	 BOTH LEDs FLASHING ALTERNATING

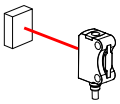
4. Configure the sensor.

Method	Action	Result
Push Button	Press push button > 1 second. 	Sensor returns to normal operation.
Remote Input	Pulse remote input wire > 1 second. 	

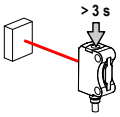
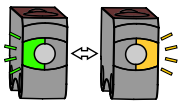
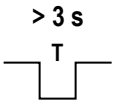
3.3 One-Point Static Background Suppression

One-point TEACH sets a single switch point. The sensor sets the switch point just behind the taught target distance.

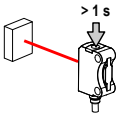
1. Present the target.

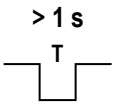
Method	Action	Result
Push Button	Present the target. The sensor-to-target distance must be within the sensor's range. 	N/A
Remote Input		

2. Start TEACH mode.

Method	Action	Result
Push Button	Press and hold push button > 3 seconds. 	 BOTH LEDs FLASHING ALTERNATING
Remote Input	Pulse remote input wire > 3 seconds. 	

3. Configure the sensor.

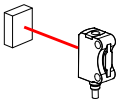
Method	Action	Result
Push Button	Press push button > 1 second. 	Sensor returns to normal operation.

Method	Action	Result
Remote Input	Pulse remote input wire > 1 second. 	

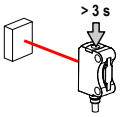
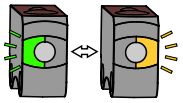
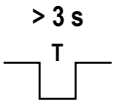
3.4 Dynamic Background Suppression

Dynamic TEACH sets a single switch point during machine run conditions. Dynamic TEACH is recommended for applications where a machine or process may not be stopped for teaching. The sensor takes multiple samples and the switch point is set just behind the farthest taught target distance, accounting for a static background.

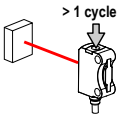
1. Present the target.

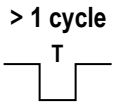
Method	Action	Result
Push Button	Present the first target. The sensor-to-target distance must be within the sensor's range. 	N/A
Remote Input		

2. Start TEACH mode.

Method	Action	Result
Push Button	Press and hold push button > 3 seconds. 	 BOTH LEDs FLASHING ALTERNATING
Remote Input	Pulse remote input wire > 3 seconds. 	

3. Configure the sensor.

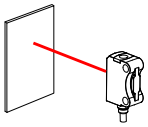
Method	Action	Result
Push Button	Press and hold push button > 1 cycle of operation. 	Sensor returns to normal operation.

Method	Action	Result
Remote Input	Pulse remote input wire > 1 cycle of operation. 	

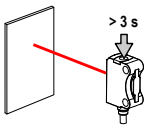
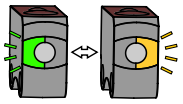
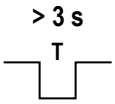
3.5 Two-Point Static Opposed and Retroreflective

Two-point TEACH for Opposed and Retroreflective modes sets a single switching level. The sensor sets the switching level between the blocked and unblocked conditions.

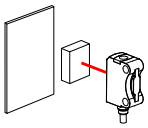
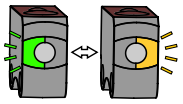
1. Align the sensor.

Method	Action	Result
Push Button **Remote Input**	Align the emitter/receiver or sensor/ retroreflector. The beam path should not be blocked. 	N/A

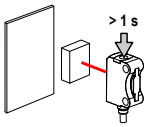
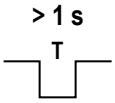
2. Start TEACH mode.

Method	Action	Result
Push Button	Press and hold push button > 3 seconds. 	 BOTH LEDs FLASHING ALTERNATING
Remote Input	Pulse remote input wire > 3 seconds. 	

3. Present the target.

Method	Action	Result
Push Button **Remote Input**	Present the target. The beam path should be blocked by the target. 	 BOTH LEDs FLASHING ALTERNATING

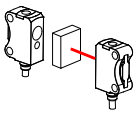
4. Configure the sensor.

Method	Action	Result
Push Button	Press and hold push button > 1 second. 	Sensor returns to normal operation.
Remote Input	Pulse remote input wire > 1 second. 	

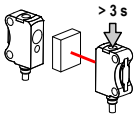
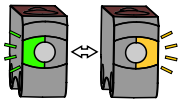
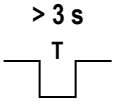
3.6 Dynamic Opposed and Retroreflective

Dynamic TEACH for Opposed and Retroreflective modes sets a single switching level during machine run conditions. Dynamic TEACH is recommended for applications where a machine or process may not be stopped for teaching. The sensor takes multiple samples and the switching level is set between the blocked and unblocked conditions.

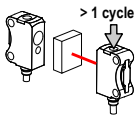
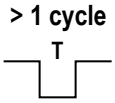
1. Present the target.

Method	Action	Result
Push Button	Present the target. The beam path should be blocked by the target. 	N/A
Remote Input		

2. Start TEACH mode.

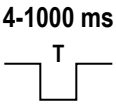
Method	Action	Result
Push Button	Press and hold push button > 3 seconds. 	 BOTH LEDs FLASHING ALTERNATING
Remote Input	Pulse remote input wire > 3 seconds. 	

3. Configure the sensor.

Method	Action	Result
Push Button	Press and hold push button > 1 cycle of operation. 	Sensor returns to normal operation.
Remote Input	Pulse remote input wire > 1 cycle of operation. 	

3.7 Select Light Operate/Dark Operate – 4-Pin Models

Change the sensor operation to light operate or dark operate for the desired application. Use either the button or the remote input wire procedure to configure the sensor.

Method	Action	Result
Push Button	Press and hold the button for longer than 10 seconds. Press the button until the desired operation is selected, then release the button and wait 10 seconds. 	1. The green LED flashes to show that the sensor is in LO/DO select mode.  GREEN LED FLASHING 2. The amber LED indicates the selected operation mode. **Light Operate**  GREEN LED FLASHING AMBER LED OFF **Dark Operate**  GREEN LED FLASHING AMBER LED ON 3. The sensor is configured and returns to normal operation.
Remote Input Wire	Pulse the remote input wire to + V DC for longer than 10 seconds. Pulse the remote input wire to + V DC for 4 to 1000 ms until the desired operation is selected and wait 10 seconds. 	

4 Specifications

Supply Voltage and Current
LED models: 10 V DC to 30 V DC (10% max. ripple) at less than 20 mA, exclusive of load
Laser models: 10 V DC to 30 V DC (10% max. ripple) at less than 12 mA, exclusive of load

Supply Protection Circuitry
Protected against reverse polarity and short-circuit

Output Protection Circuitry
Protected against output short-circuit, continuous overload, and false pulse on power-up

Output Configuration
Retroreflective and Background Suppression Models: Single PNP or NPN on pin 4 (black wire) with remote input on pin 2 (white wire)
Opposed Mode Receivers only: Single PNP or NPN on pin 4 (black wire) with remote input on pin 2 (white wire)

Output Response Time
500 µs

Output Rating
50 mA

Switching Frequency
≤ 1000 Hz

Delay Before Power-Up
< 300 ms

Laser Classifications
All Models: Class 1; wavelength: 655 nm; frequency: 5 kHz; pulse duration: 3.2 µs; limit value pulse: ≤ 2.3 mW. Reference IEC 60825-1:2001, Section 8.2.
All Models: Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to laser Notice No. 50 dated June 24, 2007.
Blue LED Models: Risk Group 2; possibly hazardous optical radiation emitted from this product. Do not stare at the operating lamp. May be harmful to the eyes. (EN62471)

Opposed Mode Model Adjustments
Push button teach input (Receivers)
Remote wire teach input (Receivers)
Remote wire beam inhibit (Emitters)

Indicators
2 LED indicators on sensor top
Green on: Power on
Amber on: Output conducting

Emitter LED Wavelength
Red LED models: 650 nm
Blue LED models: 450 nm
Laser models: 655 nm

Effective Beam
5.5 mm
This can be adjusted without an aperture by teaching the sensor

Connections
2 m (6.5 ft) unterminated 4-wire PUR cable or 200 mm (7.8 in) PUR cable with a 3- or 4-pin M8 or 4-pin M12 male quick disconnect, depending on model
Models ending in suffix "Q", "Q3", or "Q5" must be used with a UL recognized cordset R/C (CYJV2)
Search p/n 201958 at www.bannerengineering.com to view the Instruction Manual for more information on cordsets

Construction
Housing, cable: PUR
Front screen: PMMA

Operating Conditions
LED models: –20 °C to +60 °C (–4 °F to +140 °F)
Laser models: –20 °C to +50 °C (–4 °F to +122 °F)
Storage Temperature: –20 °C to +80 °C (–4 °F to +176 °F)
UL Operating Temperature: –20 °C to +30 °C (–4 °F to +86 °F)

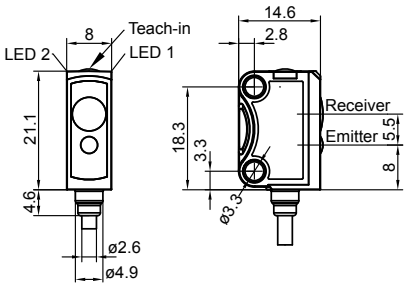
Chemical Compatibility
ECOLAB® certified (2 m cabled models only)

Environmental Rating
IP67

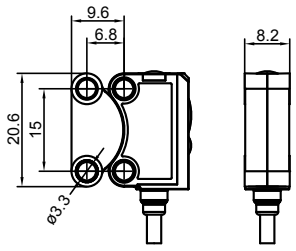
Certifications

4.1 Dimensions

All measurements are listed in millimeters [inches], unless noted otherwise.



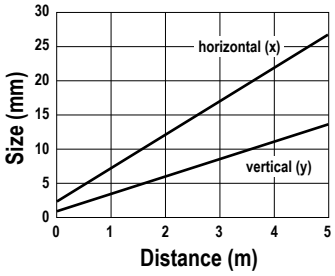
Sensor with Bracket (SMBVS8DT)



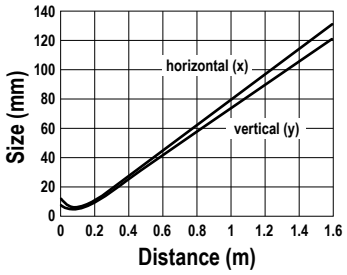
5 Performance Curves

5.1 Beam Spot Sizes

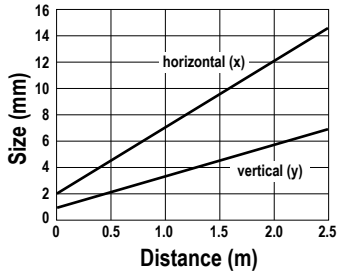
Opposed Mode



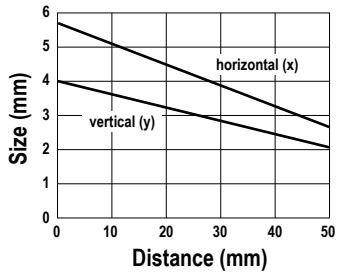
Retroreflective



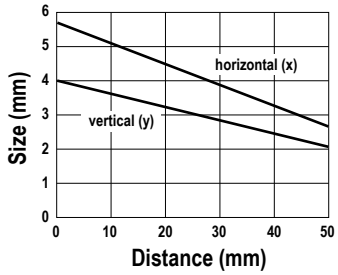
Laser Retroreflective



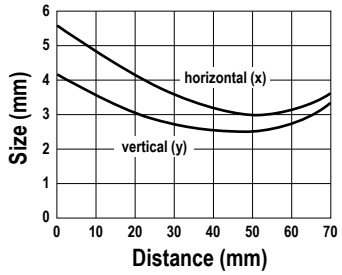
Fixed Field Background Suppression with Blue LED



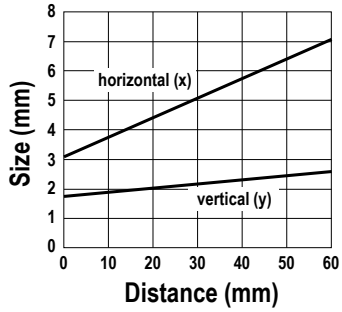
Fixed Field Background Suppression



Adjustable Field Background Suppression



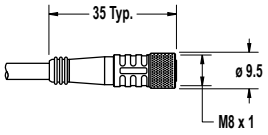
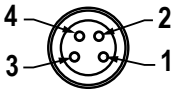
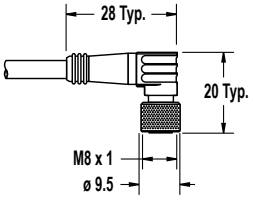
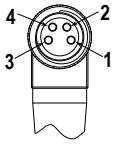
Laser Adjustable Field Background Suppression



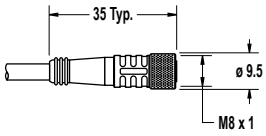
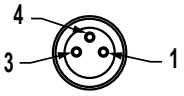
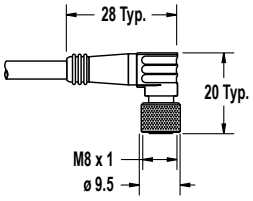
6 Accessories

6.1 Cordsets for VS8 Models with Suffix Q

All measurements are listed in millimeters, unless noted otherwise.

4-Pin Threaded M8 Cordsets—Single Ended					
Model	**Length**	**Style**	**Dimensions**	**Pinout (Female)**	
PKG4M-2	2.04 m (6.68 ft)	Straight			1 = Brown 2 = White 3 = Blue 4 = Black
PKG4M-5	5 m (16.4 ft)				
PKG4M-9	9.04 m (29.6 ft)				
PKW4M-2	2 m (6.56 ft)	Right Angle			
PKW4M-5	5 m (16.4 ft)				
PKW4M-9	9 m (29.5 ft)				

6.2 Cordsets for VS8 Models with Suffix Q3

3-pin Threaded M8 Cordsets—Single Ended				
Model	**Length**	**Style**	**Dimensions**	**Pinout (Female)**
PKG3M-2	2.035 m (6.68 ft)	Straight		 1 = Brown 3 = Blue 4 = Black
PKG3M-5	5.035 m (16.51 ft)			
PKG3M-7	7.035 m (23.08 ft)			
PKG3M-9	9.035 m (29.64 ft)			
PKG3M-10	10.035 m (32.92 ft)			
PKW3M-2	2 m (6.56 ft)	Right-Angle		
PKW3M-5	5 m (16.40 ft)			
PKW3M-9	9 m (29.53 ft)			

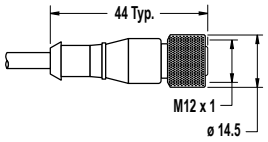
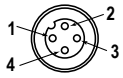
6.3 Cordsets for VS8 Models with Suffix Q5

All measurements are listed in millimeters, unless noted otherwise.

4-Pin Threaded M12 Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
Conductors: 22 AWG, gold-plated contacts
Conductors: 22 AWG, gold-plated contacts
Voltage/Current Rating: 250 V AC/DC, 4.0 A
Temperature: –40 °C to +105 °C (–40 °F to +221 °F)

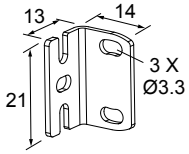
Environmental Rating: IP67/IP69K

4-Pin Threaded M12 Cordsets—Single Ended					
Model	**Length**	**Style**	**Dimensions**	**Pinout (Female)**	
MQDC-403	1 m (3.28 ft)	Straight			1 = Brown 2 = White 3 = Blue 4 = Black
MQDC-406	2 m (6.56 ft)				
MQDC-415	5 m (16.4 ft)				
MQDC-430	9 m (29.5 ft)				
MQDC-450	15 m (49.2 ft)				
MQDC-4100	30 m (98.43 ft)				

6.4 Brackets

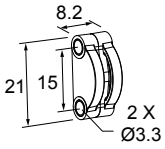
SMBVS8RA

- Right-angle bracket
- 3.1 mm stainless steel



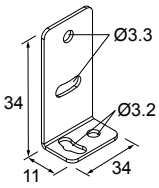
SMBVS8DT

- Dovetail clamp bracket
- Adjustable ± 10°
- Material: PBT



SMBQ12A

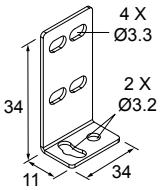
- Adjustable right-angle bracket
- 20-ga. 300 series stainless steel



Hole center spacing: A to B = 7.6
Hole size: A = 3.5 x 8.1, B=ø 3.2

SMBQ12T

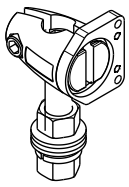
- Right-angle bracket
- 20-ga. 300 series stainless steel



Hole center spacing: A to B = 7.6
Hole size: A = 3.5 x 8.1, B=ø 3.2

SMBQ20FA

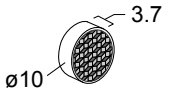
- Includes 3/8-16 × 2 in socket head cap screw (SHCS)
- 304 stainless steel



6.5 Retroreflectors

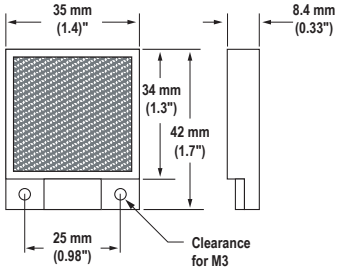
BRT-10BM

- Round, acrylic target
- Reflectivity Factor: 1.0
- Temperature: –20 °C to +60 °C (–4 °F to +140 °F)
- Micro-prism geometry
- Size: 10 mm diameter
- Reflective area: ø10 mm



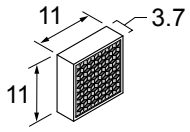
BRT-35X35BM

- Square, acrylic target
- Reflectivity Factor: 1.2
- Temperature: -20 °C to +60 °C (-4 °F to +140 °F)
- Micro-prism geometry
- Approximate size: 35 mm × 35 mm



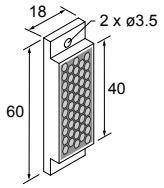
BRT-11X11M

- Square, acrylic target
- Reflectivity Factor: 1.2
- Temperature: –20 °C to +60 °C (–4 °F to +140 °F)
- Micro-prism geometry
- Approximate size: 11 mm × 11 mm



BRT-40X18A

- Rectangular, acrylic target
- Reflectivity Factor: 1.0
- Temperature: –20 °C to +60 °C (–4 °F to +140 °F)
- Approximate size: 18 mm × 50 mm



Note: For maximum adhesion of all tape products, surfaces must be clean.

Model	Reflectivity Factor	Maximum Temperature	Size
BRT-TVHG-2X2	0.8	+60 °C (+140 °F)	50 × 50 mm

These are sealed micro-prism style pieces and may not be cut.

Model	Reflectivity Factor	Maximum Temperature	Size
BRT-THG-2-100	0.7	+60 °C (+140 °F)	50 mm (2 in) wide, 2.5 m (100 in) long

7 Banner Engineering Corp. Limited Warranty

Banner Engineering Corp. warrants its products to be free from defects in material and workmanship for one year following the date of shipment. Banner Engineering Corp. will repair or replace, free of charge, any product of its manufacture which, at the time it is returned to the factory, is found to have been defective during the warranty period. This warranty does not cover damage or liability for misuse, abuse, or the improper application or installation of the Banner product.

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